follows. The protoplast of the Cyanophyceae does not differ essentially from that of other plant cells, having a nucleus and peripheral cytoplasm with chromatophores. There is always a single nucleus, organized as an independent organ and consisting of a relatively faintly staining ground mass in which the chromatin is imbedded and a larger or smaller number of "central granules" which are not found outside the nucleus. The nucleus differs from that of the higher plants (1) in the absence of a nuclear membrane,[3] (2) in the absence of nucleoli, and (3) in its form. The cytoplasm contains chromatophores, oil drops, cyanophycin granules, glycogen, and vacuoles. The chromatophores contain chlorophyll, carotin, and phycocyanin. The product of assimilation is glycogen, starch not being demonstrable, and the cyanophycin granules represent reserved albumen. The membranes of the vegetative cells are not cuticularized but consist principally of chitin, while those of the heterocyst are mostly cellulose. There are innumerable small chromatophores. The oft discussed central body is a genuine nucleus. During mitosis a spirem is formed which breaks up into chromosomes, and the various phases bear so striking a resemblance to those of higher plants that the author does not hesitate to designate them as *spirem*, *equatorial plate*, *diaster*, and *dispirem*. Threads resembling a spindle are shown in several figures. Protoplasmic connections between vegetative cells have been demonstrated in many cases. Chromatin is said to be a constant constituent of the cells of the bacteria as well of those of the Cyanophyceae, and Kohl believes that the two groups are very intimately related.—C. J. CHAMBERLAIN.

Handbook of systematic botany.

THE SECOND PART of Wettstein's handbook,[4] which has just appeared, deals with bryophytes, pteridophytes, and gymnosperms; the remaining section, which is to treat of angiosperms, will contain the index and will complete the work. The author proposes a complete system of classification, the main features of which were given in the review of the first part.[5] The taxonomic characters of the larger groups, of families, and sometimes of the most important genera, are given and the classification determines the order of treatment. However, the book is of equal interest to the morphologist, for development and embryology are carefully treated and are constantly used to support the author's views of relationships. The illustrations representing the development of organs from the standpoint of comparative morphology are particularly instructive, as is also the plate illustrating the evolution of plants, from the algae to the angiosperms. Considering the able

[3] No reference is made to the work of Lawson, who, in the BOTANICAL GAZETTE for May 1903, discussed the absence of the nuclear membrane in the Cyanophyceae.

[4] WETTSTEIN, R. v., Handbuch der systematischen Botanik. II. Band, Theil I. 8vo. pp. 160. 1 colored plate, figs. 100. Leipzig and Wien: Franz Deuticke. 1903. *M* 4.

[5] BOT. GAZ. **32**: 61–62. 1901.

manner in which the morphological part of the work is treated, one is hardly prepared for the statement that in gymnosperms there is no alternation of generations, although traces of alternation are demonstrable, while in angiosperms the reduction of the prothallium has proceeded so far that sure homologies can no longer be shown and the alternation of generations has entirely disappeared. Of particular interest are the introductory pages on the evolutionary composition of groups, the homologies between them, and the causes of the changes in the homologous organs of the cormophytes.

The bryophytes are subdivided, as usual, into Musci and Hepaticae; in the pteridophytes three groups are recognized, the Filicinae, Equisetinae, and Lycopodinae; the gymnosperms are subdivided into six classes, Cycadinae, Bennettitinae, Cordaitieae, Ginkgoanae, Coniferae, and Gnetinae.—C. J. CHAMBERLAIN.

NOTES FOR STUDENTS.

RENAULT[6] concludes from the study of a number of plant sections that vegetative activity was greater in the Carboniferous age than at present. An extraordinary development of vascular and other tissues is recounted and figured.—H. C. COWLES.

ARBER[7] has recorded *Glossopteris Browniana* Brongn. from Sisi in Rhodesia, the containing formation being probably Permo-Carboniferous. A species of Calamites is recorded from the Tuli coalfield; and the Sengwe coalfield in northern Matabeleland yields an undetermined specimen of wood and two stems of the Eu-Sigillarian Rhytidolepis type.—E. W. BERRY.

MOLLIARD finds[8] that in pure cultures of *Ascobolus sp.* perithecia are not developed, although there is a considerable development of the vegetative mycelium. In all cases of fruiting individuals bacteria are present in abundance. He thinks that this is a fact of large significance, though he has no suggestion as to the exact office of the bacteria in this interesting case of symbiosis.—H. C. COWLES.

SEWARD[9] describes a new species of Dictyozamites from a low horizon in the Estuarine series of the Inferior Oolite of Yorkshire. The genus and its distribution in Jurassic times are discussed somewhat fully, and a comparison is instituted between the lower Mesozoic floras of Japan, Bornholm,

[6] RENAULT, B., Sur l'activité végétative aux époques anciennes. Compt. Rend. **136**: 401–403. 1903.

[7] ARBER, E. A. N., Notes on some fossil plants collected by Mr. Molyneux in Rhodesia. Quart. Jour. Geol. Soc. Lond. **59**: 288–290. 1903.

[8] MOLLIARD, Rôle des bactéries dans la production des périthèces des Ascobolus. Compt. Rend. **136**: 899–901. 1903.

[9] SEWARD, A. C., On the occurrence of Dictyozamites in England, with remarks on European and eastern Mesozoic floras. Quart. Jour. Geol. Soc. Lond. **59**: 217–232. *pl. 15.* 1903.